SIEMENS

PATENT
Attorney Docket No. 2001P05854US02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor:	R. Buergel	Group Art Unit:	1792
Serial No.:	10/786,349	Examiner:	M. G. Miller
Filed:	February 25, 2004	Confirmation No.:	4552

Title: METHOD FOR RESTORING THE MICROSTRUCTURE OF A TEXTURED ARTICLE AND FOR REFURBISHING A GAS TURBINE BLADE OR VANE

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Sir:

APPELLANT'S BRIEF UNDER 37 CFR 41.37

This brief is in furtherance of the Notice of Appeal filed in this application on April 15, 2009.

1. REAL PARTY IN INTEREST - 37 CFR 41.37(c)(1)(i)

The real party in interest in this Appeal is the assignee, Siemens Aktiengesellschaft.

2. RELATED APPEALS AND INTERFERENCES - 37 CFR 41.37(c)(1)(ii)

There is no other appeal, interference or judicial proceeding that is related to or that will directly affect, or that will be directly affected by, or that will have a bearing on the Board's decision in this Appeal.

3. STATUS OF CLAIMS - 37 CFR 41.37(c)(1)(iii)

Claims pending: 13-34

Claims cancelled: 1-12

Claims withdrawn but not cancelled: None

Claims allowed: None

Claims objected to: None

Claims rejected: 13-34

The claims on appeal are 13-34.

4. STATUS OF AMENDMENTS - 37 CFR 41.37(c)(1)(iv).

A response without claim amendment was filed under 37 C.F.R. §1.116 on February 19, 2009 and was entered and considered by the Examiner. The rejections were sustained.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER- 37 CFR 41.37(c)(1)(v)

This invention relates generally to textured articles and in particular to the restoration of the microstructure of textured articles. The invention is further related to the field of refurbishment and repair of gas turbine airfoils.

Independent claim 13 is directed to a method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating as described at page 4, lines 8-14 of the specification. The method comprising the steps of coating a surface of the body with a high temperature stable surface coating thereby covering the protective coating as described in the specification at page 9, lines 30-33; restoring the microstructure of the superalloy body by performing a solution heat treatment on the body thereby maintaining the thermally stable surface coating as described in the specification at page 10, lines 1-7; removing jointly the surface coating and the protective coating and providing a second protective coating on the body as described in the specification at page 11, lines 18-28.

Independent claim 16 is directed to a method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating as described in the specification at page 4, lines 8-14. The method comprising the steps of removing the protective coating as

described in the specification at page 11, lines 9-13; coating a surface of the body with a high temperature stable surface coating as described in the specification at 9, lines 30-33; restoring the microstructure of the superalloy body by performing a solution heat treatment on the body, thereby maintaining said thermally stable surface coating as described in the specification at page 10, lines 1-7; removing the surface coating and providing a second protective coating on the body as described in the specification at page 11, lines 18-28.

Independent claim 28 is directed to a method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating as described in the specification at page 4, lines 8-14. The method comprising the steps of coating a surface of the body with a high temperature stable surface coating, thereby covering said protective coating as described in the specification at page 9, lines 30-33; performing a solution heat treatment on the body wherein a γ-phase and a γ'-phase are present in the superalloy and wherein the temperature of the solution heat treatment is at least the solution temperature of the γ' phase, thereby maintaining said thermally stable surface coating as described in the specification at page 10, lines 1-7; removing jointly the surface coating and the protective coating and providing a second protective coating on the body as described in the specification at page 11, lines 18-28, wherein grain recrystallization is suppressed by providing bulk conditions which assure a higher temperature threshold for grain recrystallization as described in the specification at page 10, lines 22-30.

Independent claim 29 is directed to a method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating as described in the specification at page 4, lines 8-14. The method comprising the steps of removing the protective coating as described in the specification at page 11, lines 9-13; coating a surface of the body with a high temperature stable surface coating as described in the specification at 9, lines 30-33; performing a solution heat treatment on said body wherein a γ-phase and a γ' phase are present in the superalloy and wherein the temperature of the solution heat treatment is at least a solution temperature of the γ'-phase, thereby maintaining said thermally stable surface coating as described in the specification at page 10, lines 1-7; removing the surface coating and providing a second protective coating on said body as described in the specification at page 11, lines 18-28, wherein grain recrystallization is suppressed by covering areas with the surface coating as described in the specification at page 10, lines 22-30.

Independent claim 30 is directed to a method for recovering texture of a textured article which is made from a superalloy as described in the specification at page 9, line 13 to page 10, line 7. The method comprising the steps of creating on a surface of the article a high temperature stable surface coating as described in the specification at 9, lines 30-33; and performing a solution heat treatment on the article wherein a γ-phase and a γ'-phase are present in the superalloy and wherein the temperature of the solution heat treatment is at least the solution temperature of the γ'-phase, thereby maintaining said thermally stable surface coating as described in the specification at page 10, lines 1-7, restoring the microstructure of the textured article and suppressing grain recrystallization by providing bulk conditions which assure a higher temperature threshold for grain recrystallization as described in the specification at page 10, lines 22-30.

6. GROUNDS OF REJECTION TO BE REVIEWED UPON APPEAL - 37 CFR 41.37(c)(1)(vi)

The grounds for rejection for claims 13, 15, 16, 18, 21, 24, 30-32 and 34 is that each claim is anticipated under 35 USC § 102(b) by Czech et al. (EP 0525545, hereinafter Czech '545).

The grounds for rejection for claims 14, 17, 19, 20, 28 and 29 is that each claim is made obvious under 35 USC § 103(a) by Czech '545 in view of Schaeffer et al. (USPN 6,500,283, hereinafter Schaeffer '283).

The grounds for rejection for claim 33 is that the claim is made obvious under 35 USC § 103(a) by Czech '545 in view of Haydon (EP 0186797).

7. ARGUMENT 37 CFR 41.37(c)(1)(vii)

Arguments applicable to claims 13-27 and 30-34:

Claims 13, 15-16, 18, 21, 24, 30-32 and 34 stand rejected under 35 USC 102(b) as being anticipated by Czech '545. Claims 14, 17, 19, 20, 28 and 29 stand rejected under 35 USC § 103(a) by Czech '545 in view of Schaeffer. Claim 33 stands rejected under 35 USC § 103(a) by Czech '545 in view of Haydon. The Appellant traverses all of these claim rejections because the Czech '545 reference fails to teach each and every element as set forth in independent claims 13,

16 and 30. All three of these independent claims contain similar limitations which are argued together below, and all of these claims rise and fall together.

MPEP 2131 provides that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claims.

The prior art reference relied upon by the Examiner in the §102(b) rejection does not contain every element and limitation recited in independent claims 13, 16 and 30.

Claims 13 and 16 recite in part "... **restoring the microstructure of the superalloy body** by performing a **solution heat treatment** on the body ...." In contrast, Czech '545 teaches a "re-diffusion treatment following an alluminization" which is not a restoration of "...the microstructure of the superalloy body .... [or] a solution heat treatment" as required by claims 13 and 16. The Examiner contends that the "re-diffusion treatment" of Czech '545 is a solution heat treatment as claimed above, and cites page 5, lines 17-21 of Czech '545 to support his contention. However, the cited text of Czech '545 recites in part:

> ...the temperature ranges are to be applied in a re-diffusion treatment ... However, **the temperature should always be kept well below the solution temperature of the base material alloy**. [emphasis added] (page 5, lines 18-20).

Applicants respectfully submit that Czech '545 itself teaches that the "re-diffusion treatment" is not a solution treatment because the treatment temperature "**should always be kept well below the solution temperature of the base material alloy**." Moreover, the "re-diffusion treatment" of Czech '545 can **not** achieve a restoration of the microstructure of the superalloy body as required by claims 13 and 16 because the re-diffusion "**temperature should always be kept well below the solution temperature of the base material alloy**."

Claim 30 recites in part "... **performing a solution heat treatment** on said article ... wherein the temperature of said solution heat treatment is **at least the solution temperature of the γ'-phase** ...." As discussed above, the "re-diffusion treatment" of Czech '545 **can not be a solution treatment** because the Czech re-diffusion "...temperature should **always be kept well below the solution temperature of the base material alloy**" and therefore is **not "at least the solution temperature of the γ'-phase"** as required by claim 30.

In the Office Communication dated March 9, 2009, the Examiner further contends that the "re-diffusion treatment" of Czech '545 is Appellants' claimed solution heat treatment citing

"Examples 1-6 of Czech, which show only partial diffusion of the aluminium into the non-corroded layer of the blade." The Examiner has mistakenly interpreted Examples 1-6 as showing partial diffusion. Czech '545 again clearly states "... the aluminide coating being of such a depth as to enclose all the products of corrosion ..." (page 3, lines 10-13). Therefore, the aluminide coating merely encapsulates the corrosion layer, and does not penetrate, or diffuse, into the lattice of the base alloy. Furthermore, the purpose of the aluminizing step of Czech '545 is to clean the base material of corrosion. If aluminium of the Aluminide coating were to diffuse into the base material, the cleaning effect would be lost and the base material part would effectively be destroyed due to contamination of the lattice with the aluminium in a manner identical to that discussed by Czech '545 at page 2, lines 38-43.

Therefore, as stated above, Czech '545 explicitly warns that "**the temperature should always be kept well below the solution temperature of the base material alloy**" (page 5, lines 18-20) to avoid diffusion of aluminium into the base material. Since Czech teaches staying below the solution temperature of all phases of the base material, and claims 13, 16 and 30 require that the temperature be above the solution temperature of at least one phase, the Czech '545 can be said to **teach away** from the presently claimed invention.

Furthermore, in the English language different words have different meanings. In Czech '545, the word used to describe the aluminizing heat treatment that the Examiner has relied upon is "re-diffusion" and Czech '545 uses the word "solution" to warn against approaching the solution temperature of the base material alloy. Therefore, Czech '545 is teaching a "re-diffusion" heat treatment which is clearly not a "solution" heat treatment as required in independent claims 13, 16 and 30.

Arguments applicable to claims 28 and 29:

Claims 28 and 29 are rejected under 35 USC 103(a) as being un-patentable over Czech '545 in view of Schaeffer '283. Appellants traverse these rejections under 35 USC 103(a) because Czech '545 teaches away from the limitations of claims 28 and 29, and the combination of Czech '545 in view of Schaeffer '283 fails to teach or suggest the claimed invention as embodied in claim 28 and 29.

As discussed above, Czech '545 fails to teach a solution heat treatment and specifically teaches away from Appellants' claimed invention by requiring that the "re-diffusion"

temperature be kept below the solution temperature of the base material alloy (which as the Examiner points out, means that the temperature must be below the solution temperature of each phase present in the alloy). In contrast to the teachings of Czech '545, Appellants claim performing a solution heat treatment where"...the temperature of said solution heat treatment is **at least the solution temperature of the γ' phase** ..." as recited in claim 28 and 29. Furthermore, the addition of Schaeffer et al. does not correct this deficiency of the primary reference and the combination does not teach or suggest the claim limitations. Therefore the combination of Czech '545 in view of Schaeffer '283 fails to obviate claims 28 and 29 in accordance with MPEP §2143.01 and the §103(a) rejections must fail.

8. CLAIMS APPENDIX - 37 CFR 41.37(c) (1) (viii).

A copy of the claims involved in this appeal is attached as a claims appendix under 37 CFR 41.37(c) (1) (viii).

9. EVIDENCE APPENDIX - 37 CFR 41.37(c) (1) (ix)

None is required under 37 CFR 41.37(c) (1) (ix).

10. RELATED PROCEEDINGS APPENDIX - 37 CFR 41.37(c) (1) (x)

None is required under 37 CFR 41.37(c) (1) (x).

Respectfully submitted,

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APPENDIX OF CLAIMS ON APPEAL

13. A method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating, the method comprising the steps of:
coating a surface of said body with a high temperature stable surface coating, thereby covering said protective coating;
restoring the microstructure of the superalloy body by performing a solution heat treatment on the body, thereby maintaining said thermally stable surface coating;
removing jointly said surface coating and said protective coating; and
providing a second protective coating on said body.

14. The method according to claim 13,
wherein a γ-phase and a γ'-phase are present in said superalloy and wherein the temperature of said solution heat treatment is at least the solution temperature of the γ' phase.

15. The method according to claim 13,
wherein said solution heat treatment is performed with a temperature above 1100 0C.

16. A method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating, the method comprising the steps of:
removing the protective coating;
coating a surface of said body with a high temperature stable surface coating;
restoring the microstructure of the superalloy body by performing a solution heat treatment on said body, thereby maintaining said thermally stable surface coating;
removing the surface coating; and
providing a second protective coating on said body.

17. The method according to claim 16,
wherein a γ-phase and a γ'-phase are present in the superalloy and wherein the temperature of said solution heat treatment is at least a solution temperature of the γ'-phase.

18. The method according to claim 16,
wherein said solution heat treatment is performed with a temperature above 1100 °C.

19. The method according to claim 13 or 16,
wherein the textured article is a single crystal article.

20. The method according to claim 13 or 16,
wherein the textured article is a directionally solidified article.

21. The method according to claim 13 or 16,
wherein said surface is applied with an appropriate surface coating.

22. The method according to claim 13 or 16,
wherein the surface layer is applied to a region which has been newly built up, in particular has been produced by build-up welding.

23. The method according to claim 13 or 16,
wherein the surface layer is applied to a region which surrounds a repaired crack.

24. The method according to claim 13 or 16,
wherein a metallic surface layer, in particular of nickel or cobalt is used.

25. The method according to claim 24,
wherein the metallic layer is applied by electroplating.

26. The method according to claim 24,
wherein the surface layer is applied by cold gas spraying.

27. The method according to claim 25 or 26,
wherein the surface layer is removed by means of an acid treatment.

28. A method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating, the method comprising the steps of:

coating a surface of said body with a high temperature stable surface coating, thereby covering said protective coating;

performing a solution heat treatment on the body wherein a γ-phase and a γ'-phase are present in said superalloy and wherein the temperature of said solution heat treatment is at least the solution temperature of the γ' phase, thereby maintaining said thermally stable surface coating;

removing jointly said surface coating and said protective coating; and

providing a second protective coating on said body, wherein grain recrystallization is suppressed by providing bulk conditions which assure a higher temperature threshold for grain recrystallization.

29. A method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating, the method comprising the steps of:

removing the protective coating;

coating a surface of said body with a high temperature stable surface coating;

performing a solution heat treatment on said body wherein a γ-phase and a γ' phase are present in the superalloy and wherein the temperature of said solution heat treatment is at least a solution temperature of the γ'-phase, thereby maintaining said thermally stable surface coating;

removing the surface coating; and

providing a second protective coating on said body,

wherein grain recrystallization is suppressed by covering areas with said surface coating.

30. A method for recovering texture of a textured article which is made from a superalloy, comprising the steps of:

creating on a surface of the article a high temperature stable surface coating; and

performing a solution heat treatment on said article wherein a γ-phase and a γ'-phase are present in said superalloy and wherein the temperature of said solution heat treatment is at least the solution temperature of the γ'-phase, thereby maintaining said thermally stable surface coating, restoring the microstructure of the textured article, and suppressing grain recrystallization by providing bulk conditions which assure a higher temperature threshold for grain recrystallization.

31. The method according to claim 30, wherein said article is a gas turbine component.

32. The method according to claim 31, wherein said gas turbine component is a blade or a vane.

33. The method according to claim 30, wherein said superalloy is cobalt-based with precipitations or carbides that provide a strengthening mechanism similar to a γ-phase in Nickel based alloys.

34. The method according to claim 24,

wherein the surface layer is removed by means of an acid treatment.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.